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PATENT SPECIFICATION

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546,975

PROVISIONAL SPECIFICATION

Improvements in Treads for Pneumatic Tyres

We, DUNLOP RUBBER COMPANY LIMITED, a British Company, of Dunlop House, 1, Albany Street, in the County of London, FRANK GEORGE WILLIAM KING, LEONARD JOHN LAMBOURN, and FRANCIS JOSEPH McNALLY, all British Subjects and all of the aforesaid Company's Works at Fort Dunlop, Erdington, Birmingham, in the County of Warwick, do hereby the nature of this invention to be as follows:—

This invention concerns improvements in treads for pneumatic tyres and more particularly concerns improvements in non-skid tyre treads.

It has already been proposed to impart non-skid properties to pneumatic tyre treads by forming them with portions of different degrees of hardness for example by the use of tread compounds of non-uniform chemical compositions whereby softer and more yielding portions may be formed at intervals in the treads.

The treads of such tyres may be moulded to provide continuous surface contact between the tread and the road surface thus retaining quiet running and even wear in existing high speed travel but their manufacture is inherently more difficult and expensive as compared to a tyre having a tread formed throughout from a uniform or homogeneous composition.

Most modern tyre patterns usually have several circumferential ribs, but these while not affording maximum road grip, compressibility and cooling, are advantageous from the point of view of quiet running.

Separate stud patterns on the other hand usually have good road grip, flexibility, compressibility and air cooling, but tend to wear irregularly and are generally noisy.

The object of the present invention is to provide a tread combining the advantages of a pattern with separate studs, blocks or solid units and those of a pattern with circumferential ribs.

Additional advantages of the improved tread are increased flexibility of the tread without appreciable loss in stability, and slightly improved cooling.

According to this invention a pneumatic tyre tread is composed of rubber, selected portions of which are softened and rendered more flexible and more compressible than the remainder of the tread by groups of small holes spaced apart around the tread, thus giving these portions of the tread a cellular like structure.

It should be emphasised that the multiplicity of small holes at any particular part or parts of the tread is not there to produce tread pattern but to give a particular property to a portion or portions of the tread rubber which may be of homogeneous composition.

Such portions of the tread unit can be incorporated in or superimposed upon existing tread patterns to produce an improvement of the type described.

The groups of holes may be spaced apart circumferentially or transversely, to uniform, non-uniform or to predetermined distances circumferentially or transversely around the tread.

Said groups may also extend obliquely across the load supporting surface or surfaces of the tread and the transversely extending marginal portions of adjacent or other groups may be inclined in opposite directions to each other if desired.

The groups of holes may be spaced apart circumferentially to a predetermined distance for example to a distance greater than the circumferential extent of each group thereby preserving a predetermined ratio between the harder and softer portions of the tread.

The holes may be of any suitable shape, regular or irregular, and they may be of circular, rectangular, square, diamond, triangular or polygonal formation for example of star or hexagon cross section and any one group or groups may consist of holes having one or other or a mixture of such shapes.

The holes may be of uniform section for the whole of their depth or may be tapering, either being smaller at the base than at the top or *vice-versa*, and they may have a rounded base which may be enlarged and of bulbous section.

The upper ends of the holes merging into the tread surface may be enlarged to provide an effect similar to that provided by counter-sunk screw holes.

[*Price* 1/-]

The holes may also be provided in the form of groups of slots of narrow width of equal or unequal lengths which may extend circumferentially to the required distances, the ends of other portions of which may be interconnected by transverse slots.

The holes may be inclined at uniform or varying inclinations to the tread surface, for example the apertures at or adjacent the centre may be radial or slightly inclined thereto on opposite sides of the mid-plane of the tyre while those adjacent the shoulders of the tyre may be substantially horizontal or inclined downwards at the outer ends towards the axis of the tyre.

The holes may be of uniform or varying depths, for example they may be of the same depth as that of the normal grooves separating any ribs or studs or may be deeper or less deep as may be found desirable. The depths of the holes may also be graduated, for example those in the centre of the tread or in the centre of each rib or block may extend more deeply than those at the side of the ribs or blocks which may diminish in depth.

The apertures in the side wall or buttress portions of the tread may similarly vary in length, the shorter apertures being nearer the tread surface and increasing in length in the second and third rows beneath them.

Knife cuts may also be provided in the tread between said groups and may be formed more particularly in close combination with said groups as for example to define the boundaries of individual groups which may be of irregular outline as for example of serrated or castellated form in a transverse or circumferential direction.

Two or more of the holes in the same or adjacent groups may be oppositely inclined in circumferential or transverse directions so as to interconnect with one another by intersection below the tread surface, thereby obviating any noise from entrapped air.

Where the tread pattern comprises several continuous circumferential ribs or a combination of such ribs and isolated blocks, some of said ribs and blocks may be moulded without groups of small holes which may be formed at intervals in the remaining ribs or blocks.

Where the tread is formed with blocks or grooves which are interconnected with tie-bars at or below the level of the tread surface said tie-bars may also be formed with groups of small holes.

In one convenient form of the invention a tyre tread is composed of a homogeneous composition of rubber and is moulded with a plurality of circumferentially extending ribs each of uniform width as for example with six ribs two of which are adjacent and one on each side of the mid-plane of the tyre, these two central ribs having two broader ribs flanking them, one on each side of the tyre, and two ribs of intermediate width adjacent the tyre walls on opposite sides of the tyre. The five grooves separating the ribs may be of equal width.

All these ribs may be formed at circumferential intervals with rectangular groups of holes, for example the central ribs may be formed with rectangular groups of twelve holes arranged in four rows each of three holes extending across the rib.

The broader ribs may be formed at circumferential intervals with square shaped groups of sixteen holes each of somewhat larger diameter than those in the central ribs. The flanking ribs may also be formed with circumferentially spaced groups of six holes in two rows each of three holes of the same or similar size to those in the broader ribs.

The groups of holes may be staggered circumferentially in relation to the groups of holes in the adjacent rib or ribs in any suitable manner, for example the groups in the two central ribs may be staggered in relation to one another so that the groups of holes in one of these ribs is adjacent an unapertured portion between the adjacent pair of groups formed in the adjacent central rib.

Similarly the groups of holes in each of the broader ribs may be formed at circumferential intervals corresponding to the groups formed in the adjacent central rib, or may be staggered in relation thereto.

The smaller groups in each of the flanking ribs may be formed intermediate the groups in each of the broader ribs adjacent thereto.

In a modification of the above the two broader ribs may be moulded without holes.

Dated the 31st day of January, 1941.
W. BOND,
Acting for the Applicants.

COMPLETE SPECIFICATION

Improv ments in Treads f r Pneumatic Tyres

We, DUNLOP RUBBER COMPANY LIMITED, a British Company, of 1, Albany Street, in the County of London, FRANK GEORGE WILLIAM KING, LEONARD JOHN LAMBOURN and FRANCIS JOSEPH McNALLY, all British Subjects, and all of the aforesaid

Company's Works at Fort Dunlop, Erdington, Birmingham, in the County of Warwick, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention concerns improvements in treads for pneumatic tyres and more particularly concerns improvements in non-skid tyre treads.

It has already been proposed to impart non-skid properties to pneumatic tyre treads by forming them with portions of different degrees of hardness for example by the use of tread compounds of non-uniform chemical compositions whereby softer and more yielding portions may be formed at intervals in the treads.

The treads of such tyres may be moulded to provide continuous surface contact between the tread and the road surface thus retaining quiet running and even wear in existing high speed travel but their manufacture is inherently more difficult and expensive as compared to a tyre having a tread formed throughout from a uniform or homogeneous composition.

Most modern tyre patterns usually have several circumferential ribs, which while not affording maximum road grip, compressibility and cooling, are advantageous from the point of view of quiet running.

Separate stud patterns on the other hand usually have good road grip, flexibility, compressibility and air cooling, but tend to wear irregularly and are generally noisy.

The object of the present invention is to provide a tread combining the advantages of a pattern having separate studs, blocks or solid units with those of a pattern having circumferential ribs.

Additional advantages of the improved tread are increased flexibility of the tread without appreciable loss in stability, and slightly improved cooling.

Treads for pneumatic tyres have also been proposed which are formed with groups of depressions or slots which extend circumferentially around the tread either in a single series of closely adjacent groups, or in several of such series in which the groups in adjacent ribs or studs are formed side by side so that they extend in a transverse direction across the whole width of the tyre tread in substantially the same plane.

In the constructions referred to above the modification to the tread imparted by such groups of depressions or slots affects the whole or the major part of the load sustaining area of the tread, whereas in the improved tread described below holes are grouped in clusters which are so disposed in relation to each other in adjacent ribs that the load is always partly sustained by portions of the tread of non-cellular formation, thus minimising the tendency to rapid wear.

According to this invention we provide a tyre tread having circumferential load supporting ribs portions of which ribs are rendered softer than the remainder by clusters of holes formed at circumferentially staggered intervals in adjacent ribs.

It should be emphasised that the multiplicity of small holes at any particular part or parts of the tread is not there to produce tread pattern but to give a particular property to a portion or portions of the tread rubber which may be of homogeneous composition.

In order that the invention may be more easily understood and readily carried into effect, the same will now be described with reference to the accompanying drawings in which:—

Figs. 1 and 3 are plan views of tyre treads according to the invention.

Fig. 2 is a sectional view on the line A—A of Fig. 1.

Fig. 4 is a sectional view on the line B—B of Fig. 3.

Fig. 5 is a sectional view of a modification to a portion of the tread.

Figs. 6 to 10 are plan views of groups of holes of different shapes.

Figs. 11 to 13 are sectional views of various forms of holes.

Fig. 14 is a plan view of a modification of the tread.

In one convenient form of the invention as shown in Figs. 1 to 4 a tyre tread is composed of a homogeneous composition of rubber and is moulded with load supporting surfaces in the form of a plurality of circumferentially extending ribs as for example with six ribs of which two ribs 1 are adjacent and on each side of the mid-plane of the tyre, these two central ribs 1 having two broader ribs 2 flanking them, one on each side of the tyre, and two flanking ribs 3 of intermediate width adjacent the tyre walls on opposite sides of the tyre. The five grooves 4 separating the ribs may be of equal width.

These ribs are formed at circumferential intervals with clusters of holes, for example the central ribs 1 may be formed with rectangular clusters of twelve holes 5 each cluster consisting in a transverse direction of three circumferential series of four holes.

The broader ribs 2 may be formed with square shaped clusters of sixteen holes 6 each of somewhat larger diameter than those in the central ribs. The flanking ribs 3 as shown in Figs. 1 and 2 may also be formed with circumferentially spaced

clusters of six holes in two rows each of three holes 7 of the same or similar size to those in the broader ribs.

The groups of holes are spaced apart circumferentially to a distance equal to or preferably greater than the circumferential extent of each group as shown in Figs. 1 and 2 thereby preserving a predetermined ratio between the harder and softer portions of the tread, the latter preferably constituting a minor proportion of the tread surface.

The clusters of holes are staggered circumferentially in relation to the clusters of holes in the adjacent rib or ribs in any suitable manner, for example the clusters in the two central ribs 1 are staggered in relation to one another so that the clusters of holes in either one of these ribs is adjacent an unapertured portion in the adjacent rib.

Similarly the clusters of holes in each of the broader ribs 2 are formed at circumferential intervals between the clusters formed in the adjacent flanking ribs 3.

In a modification of the above the two broader ribs 2 may be moulded without holes.

The holes may be inclined at uniform or varying inclinations to the tread surface, for example the holes in the ribs 1 and 2 at or adjacent the centre may be radial or slightly inclined thereto on opposite sides of the mid-plane of the tyre while those in the ribs 3 Figs. 3 and 4 adjacent the shoulders of the tyre may be substantially horizontal or inclined downwards at the outer ends towards the axis of the tyre.

As shown in Figs. 2 and 4 the holes may be of uniform or varying depths, for example they may be of the same depth as that of the normal grooves separating any ribs or may be deeper or less deep as may be found desirable. The lengths or depths of the holes may also be graduated, for example those holes 5 in the centre of the tread or in the centre of each rib may extend more deeply as shown at 8 Figs. 2 and 4 than those holes 9 Figs. 2 and 4 at the sides of such rib.

The holes in the flanking ribs 3 or buttress portions of the tread may similarly vary in length, the shorter holes 9 Fig. 4 being nearer the tread surface and progressively increasing in length in the second and third rows beneath them.

As shown in Fig. 5 the holes 5 in any one cluster may be interconnected at 11 below the tread surface, and they may also be interconnected with holes in an adjacent cluster.

Where the tread is formed with ribs which are interconnected with tie-bars at or below the level of the tread surface these tie-bars (not shown) may also be formed with clusters of small holes.

As shown in Figs. 6 to 10 the holes may be of any suitable shape, regular or irregular, but are preferably of circular, rectangular, square, diamond, triangular or polygonal formation for example of star or hexagon cross section and any cluster or clusters may consist of holes all having one or other of these shapes or a mixture of such shapes.

The holes may be of uniform section for the whole of their depth as shown in Figs. 2 and 4 or may be of tapering section, either being smaller at the base than at the top as shown in Fig. 11 or *vice-versa* as shown in Fig. 12, and they may have a rounded base 11 Fig. 13 which may be enlarged and of bulbous section.

The upper ends of the holes merging into the tread surface may be enlarged as shown at 12 Fig. 13 to provide an effect similar to that provided by counter-sunk screw holes.

In the tread shown in Fig. 14 clusters of square holes are formed to extend obliquely across the load supporting surfaces 1, 2 and 3 of the tread, such clusters being inclined transversely of the tread in opposite directions to each other in adjacent ribs.

Knife cuts 13 and 13*a* may also be provided in the tread between said clusters and may be formed more particularly in close combination with said clusters as for example at 13*a* to define the boundaries of the individual clusters which may be of irregular outline as for example of the castellated form shown in the transverse direction.

In a further modification the holes may also be provided in the form of slots of narrow width of equal or unequal lengths which may extend circumferentially to the required distances.

Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is:—

1. A tyre tread having circumferential load supporting ribs portions of which ribs are rendered softer than the remainder by clusters of holes formed at circumferentially staggered intervals in adjacent ribs.

2. A tyre tread according to claim 1 wherein the clusters of holes are spaced apart circumferentially at distances equal to or greater than the circumferential extent of such clusters.

3. A tyre tread according to claim 1 or claim 2 wherein said holes are inclined to the tread surface at varying angles.

4. A tyre tread according to any of the preceding claims wherein said holes are of varying depth or length.

5. A tyre tread according to any of the preceding claims wherein two or more of the holes are interconnected with one another below the surface of the tread.

6. A tyre tread according to any of the preceding claims wherein two or more of the holes in adjacent clusters of holes are interconnected with another below the surface of the tread.

7. A tyre tread according to any of the preceding claims wherein said holes are of round, rectangular, diamond shaped, triangular or polygonal formation.

8. A tyre tread according to any of the preceding claims wherein said holes are grouped in clusters containing holes of similar shape and size.

9. A tyre tread according to any of the preceding claims wherein said holes are formed in clusters which extend obliquely across the load supporting surfaces of the tread.

10. A tyre tread according to any of the preceding claims wherein the edges of said clusters of holes are defined by knife cuts extending across the tread.

11. A tyre tread according to any of the preceding claims wherein said holes are provided in the form of slots extending circumferentially of the tread.

12. A pneumatic tyre having a tread substantially as described with reference to the accompanying drawings.

Dated the 21st day of October, 1941.

W. BOND,
Acting for the Applicants.

Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1942.

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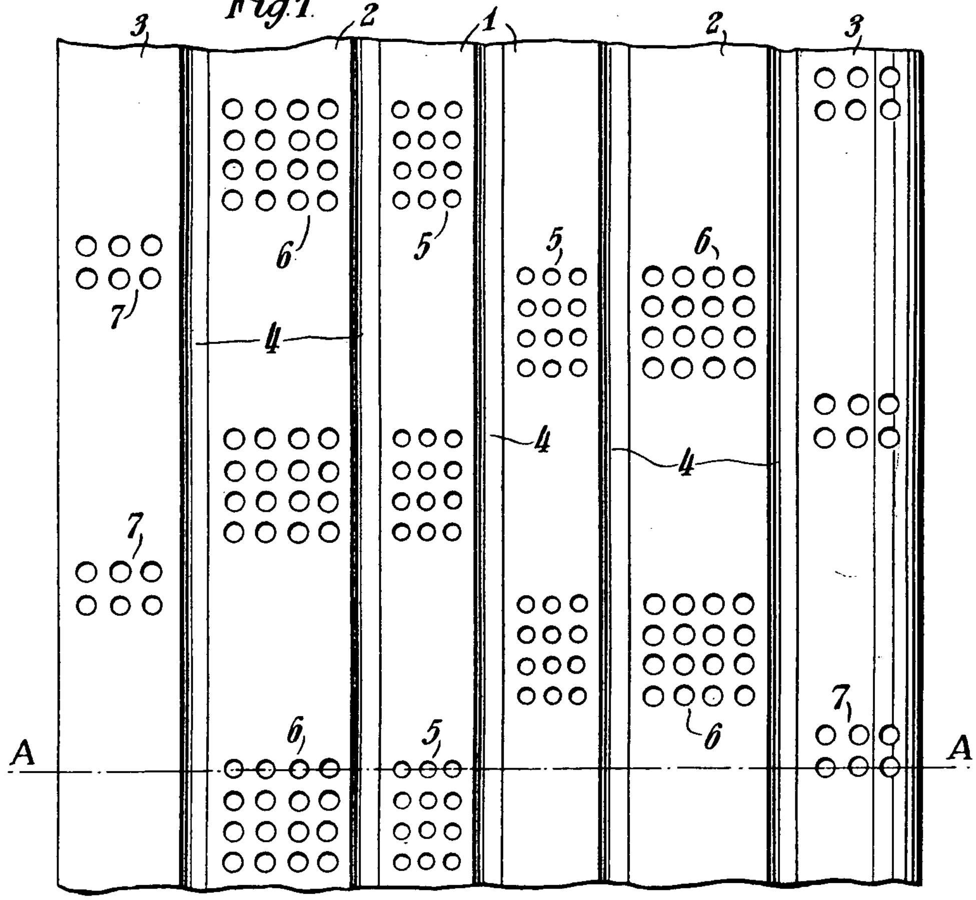
Fig.1.



Holes can be at same depth as groove

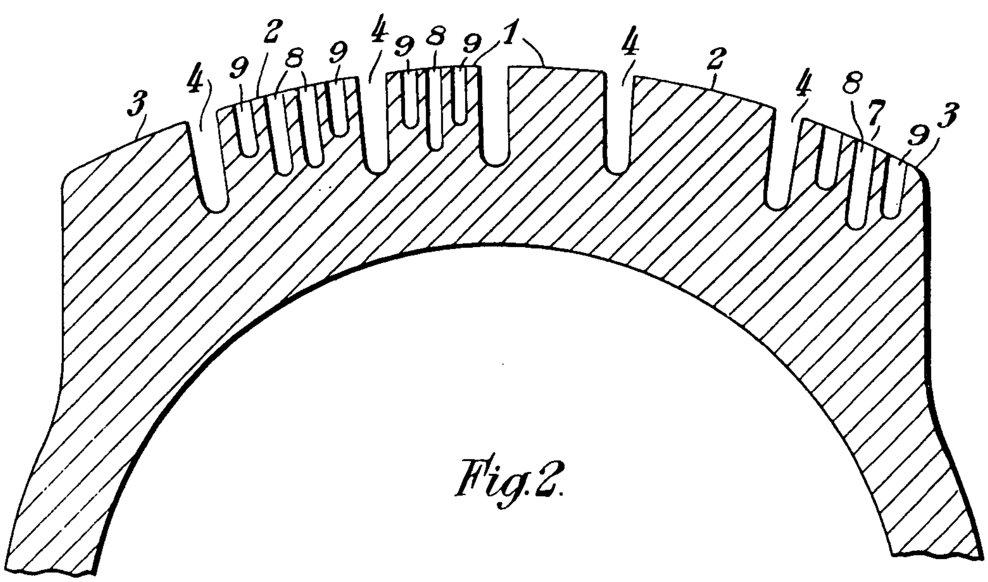


Fig.2.

Fig. 3.

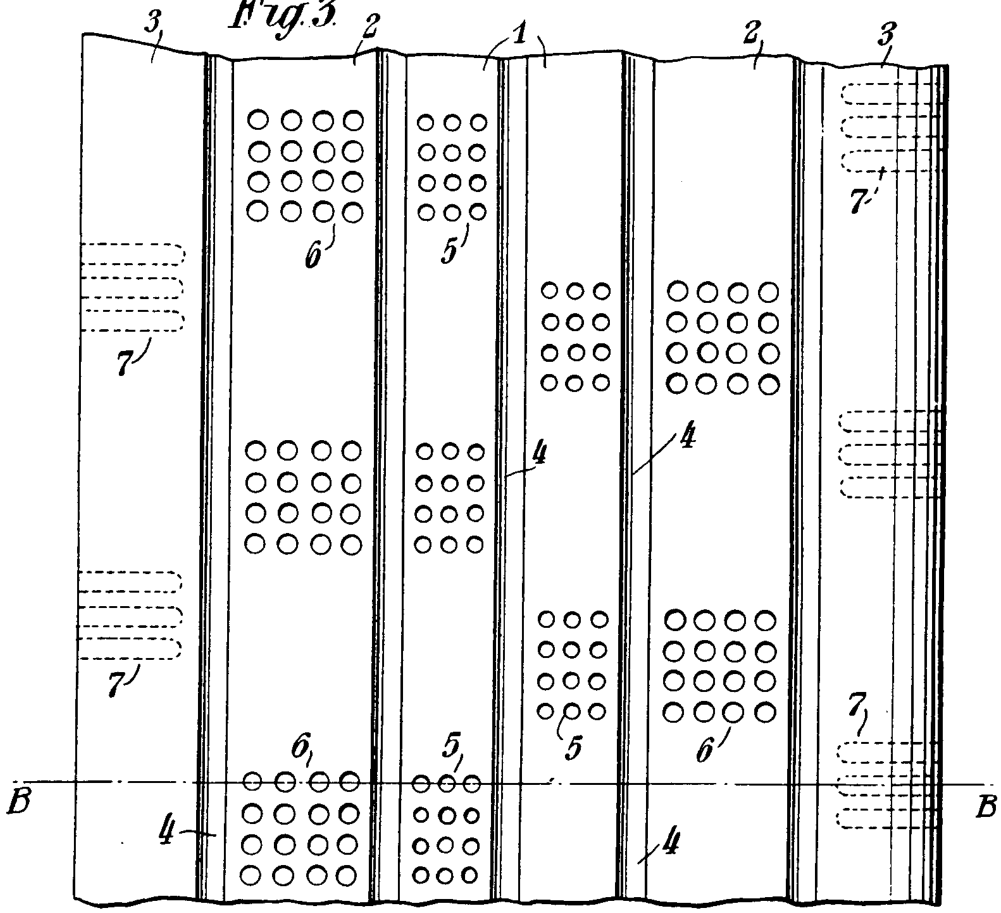


Fig. 4.

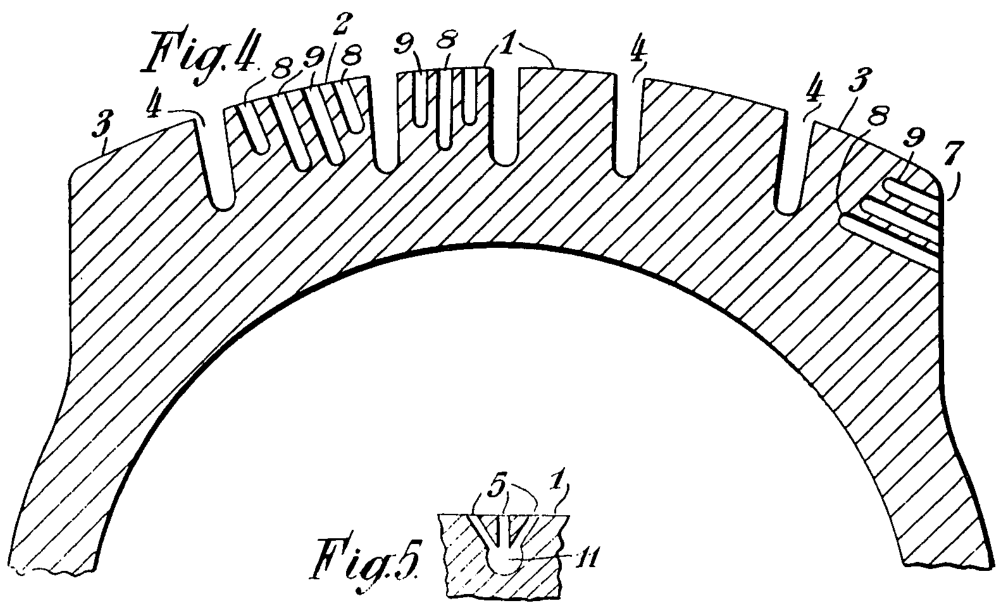


Fig. 5.

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Fig.6.

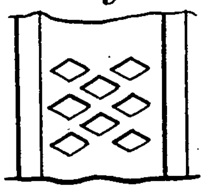


Fig.7.

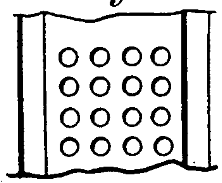


Fig.8.

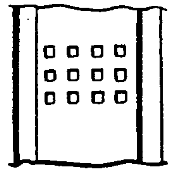
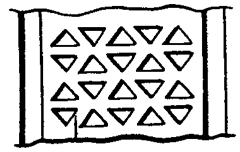


Fig.9.



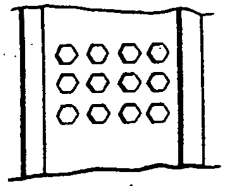


Fig.10.

Fig.14.

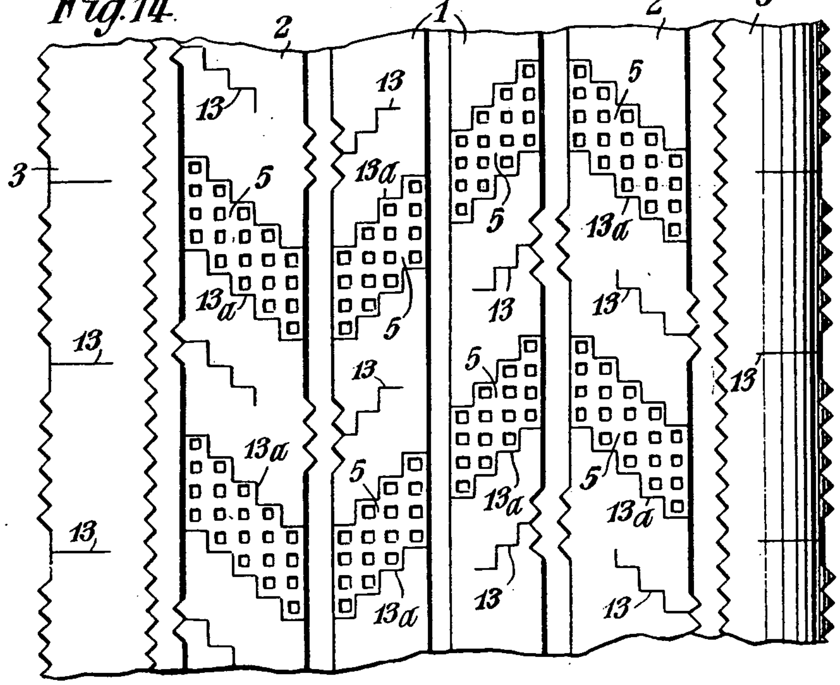


Fig.11.

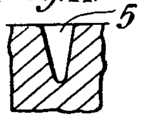


Fig.12.

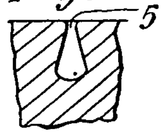
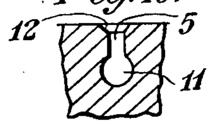


Fig.13.



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